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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/611,555	07/01/2003	Naoya Hasegawa	9281-4590	5023

7590 07/05/2005

Brinks Hofer Gilson & Lione  
P.O. Box 10395  
Chicago, IL 60610

EXAMINER
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BERNATZ, KEVIN M

ART UNIT	PAPER NUMBER
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1773

DATE MAILED: 07/05/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/611,555

Applicant(s)

HASEGAWA ET AL.

Examiner

Kevin M Bernatz

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-20 and 78 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-10, 15-19 and 78 is/are rejected.
- 7) ☒ Claim(s) 11-14 and 20 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 01 July 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>4/27/05</u> . | 6) <input type="checkbox"/> Other: ____.  |

## **DETAILED ACTION**

### ***Response to Amendment***

1. Amendments to the specification and claims 1 and 14, cancellation of claims 21 - 77, and addition of new claim 78, filed on April 6, 2005, have been entered in the above-identified application.
2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

### ***Examiner's Comments***

3. The Examiner notes that the present claim language does not require that the first free magnetic layer be exclusively located between the second antiferromagnetic layers, provided that second antiferromagnetic layers are disposed on each side of the multilayer film.
4. The Examiner further notes that the language "a second free magnetic layer disposed from an upper surface of the second antiferromagnetic layer to an upper surface of the first free magnetic layer, the second free magnetic layer distinct from the first free magnetic layer" is open to at least the two embodiments shown below in Figure 1. The Examiner notes that applicants' appear to only disclose embodiment II in their as-filed disclosure and the Examiner recommends clarifying the claim language to positively recite that the second free magnetic layer is disposed "on the upper surface of both the second free antiferromagnetic layer and the first free magnetic layer".

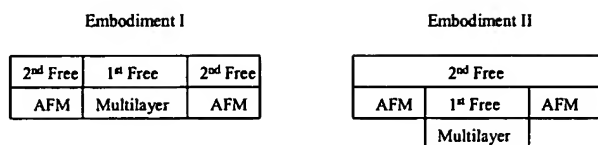


Figure I: Illustration of Interpretation of Claim Language

5. Regarding the limitation(s) “distinct” in claim 1, the Examiner has given the term(s) the broadest reasonable interpretation(s) consistent with the written description in applicants’ specification as it would be interpreted by one of ordinary skill in the art. *In re Morris*, 127 F.3d 1048, 1054-55, 44 USPQ2d 1023, 1027 (Fed. Cir. 1997); *In re Donaldson Co., Inc.*, 16 F.3d 1190, 1192-95, 29 USPQ2d 1845, 1848-50 (Fed. Cir. 1994). See MPEP 2111. Specifically, the Examiner notes that the first and second free magnetic layers must possess some difference in either composition or crystallography, or an additional layer must be located therebetween. E.g. a first and second free magnetic layer directly contacting each other and formed of the same NiFe alloy is not deemed to read on the limitation “the second free magnetic layer distinct from the first free magnetic layer”, even if the two layers are deposited separately since the final product would be indistinguishable from a product formed from a single material and subsequently etched into the desired shape.

***Claim Objections***

6. Claims 11 – 14 and 20 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

***Claim Rejections - 35 USC § 102***

7. Claims 1 – 5, 9, 10, 15 – 19 and 78 are rejected under 35 U.S.C. 102(a) and/or (b) as being anticipated by Hayashi et al. (JP 2002-050011 A) – and –

8. Claims 1 – 5, 9, 10, 15 – 19 and 78 are rejected under 35 U.S.C. 102(a) and/or (e) as being anticipated by Hayashi et al. (U.S. Patent App. No. 2002/0097540 A1).

The Examiner notes that US '540 A1 is the English Language equivalent of JP '011 A and all column + line citations will refer to US '540 A1.

Regarding claim 1, Hayashi et al. disclose a magnetic detecting element comprising a multilayer laminate including a first antiferromagnetic (AFM) layer (*Figure 69, element 6b*), a pinned magnetic layer (*element 5*), a nonmagnetic material layer (*element 4*), and a first free magnetic layer (*element 3b*) in that order from a bottom thereof; a second AFM layer disposed in a track width direction at each side of the multilayer laminate in the track width direction (*elements 2b*); and a second free magnetic layer disposed from an upper surface of the second AFM layer to an upper surface of the first free magnetic layer, the second free magnetic layer distinct from the first free magnetic layer (*element 12*).

Regarding claims 2 and 3, Hayashi et al. disclose a non-magnetic layer between the first and second free meeting applicants' claimed limitations (*element 13 and relevant disclosure thereto*).

Regarding claims 4 and 5, Hayashi et al. disclose a ferromagnetic layer meeting applicants' claimed limitations (*element 8b*). The Examiner notes that element 13 is a non-magnetic layer between the ferromagnetic layer (*element 8b*) and the second free magnetic layer (*element 12*).

Regarding claims 9 and 10, Hayashi et al. disclose a backed layer meeting applicants' claimed limitations (*Figure 70, element 15 and relevant disclosure thereto*).

Regarding claim 15, Hayashi et al. disclose elements having a 90° angle, hence meeting applicants' claimed limitations (*Figures 56, 57 and 89*).

Regarding claims 16 – 19, Hayashi et al. disclose electrodes and insulating layers meeting applicants' claimed structural limitations (*Figure 70, elements 1, 11, 15 and 17*).

Regarding claim 78, Hayashi et al. disclose the second free magnetic layer as a continuous layer (*Figure 69*).

9. Claims 1, 9, 10, 15 – 17 and 78 are rejected under 35 U.S.C. 102(e) as being anticipated by Ho et al. (U.S. Patent No. 6,754,056 B2).

Regarding claim 1, Ho et al. disclose a magnetic detecting element comprising a multilayer laminate including a first antiferromagnetic (AFM) layer (*Figure 13, element 206*), a pinned magnetic layer (*element 208*), a nonmagnetic material layer (*element*

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212), and a first free magnetic layer (*element 214*) in that order from a bottom thereof; a second AFM layer disposed in a track width direction at each side of the multilayer laminate in the track width direction (*elements 224 and 226*); and a second free magnetic layer disposed from an upper surface of the second AFM layer to an upper surface of the first free magnetic layer, the second free magnetic layer distinct from the first free magnetic layer (*elements 240, 242 and 244*).

Regarding claims 9 and 10, Ho et al. disclose a backed layer meeting applicants' claimed limitations (*element 236 and relevant disclosure thereto*).

Regarding claim 15, Ho et al. disclose elements having a 90° angle, hence meeting applicants' claimed limitations (*Figure 13*).

Regarding claims 16 and 17, Ho et al. disclose electrodes meeting applicants' claimed structural limitations (*elements 204 and 236*).

Regarding claim 78, Ho et al. disclose the second free magnetic layer as a continuous layer (*Figure 13*).

### ***Claim Rejections - 35 USC § 103***

10. Claims 6 – 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hayashi et al. (JP '011 A) as applied above, and further in view of Singleton et al. (U.S. Patent No. 6,700,753 B2) – and -

11. Claims 6 – 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hayashi et al. (US '540 A1) as applied above, and further in view of Singleton et al. (U.S. Patent No. 6,700,753 B2).

Hayashi et al. is relied upon as described above.

Hayashi et al. fail to disclose a specular layer meeting applicants' claimed material and structural limitations.

However, Singleton et al. teach using specular layers either on an upper surface of the second free magnetic layer, or as the middle layer of a synthetic ferromagnetic structure (as in Hayashi et al.) for improved MR ratio and sensitivity (*Figures; col. 2, lines 7 – 22; and col. 5, lines 32 – 49*).

It would therefore have been obvious to one of ordinary skill in the art at the time of the applicant(s) invention to modify the device of Hayashi et al. to use a specular layer meeting applicants' claimed limitations as taught by Singleton et al. in order to achieve improved MR ratio and sensitivity.

12. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hayashi et al. (JP '011 A) as applied above, and further in view of Komuro et al. (U.S. Patent App. No. 2002/0097536 A1) – and –

13. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hayashi et al. (US '540 A1) as applied above, and further in view of Komuro et al. (U.S. Patent App. No. 2002/0097536 A1).

Hayashi et al. is relied upon as described above.

While the Examiner deems that Hayashi et al. disclose elements meeting applicants' claimed angle, the Examiner notes that Hayashi et al. fail to explicitly disclose said angles.



However, Komuro et al. teach that it is known in the art to form the MR element portion to have an angle meeting applicants' claimed limitations in order to control the surface area on the side portions of the films (i.e. steeper angle = larger surface area).

It would therefore have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Hayashi et al. to use an angle meeting applicants' claimed limitations as taught by Komuro et al. since such angles are known in the art for MR sensors and can be used to tailor the surface area of the sides of the films.

14. Claims 2 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ho et al. as applied above, and further in view of Hayashi et al. (JP '011 A). See Hayashi et al. (U.S. '540 A1), which is the English Language equivalent of JP '011 A.

Ho et al. is relied upon as described above.

Ho et al. fail to disclose a structure meeting applicants' claimed limitations.

However, Hayashi et al. teach that a structure comprising a non-magnetic layer between the first and second free magnetic layer is a known equivalent structure to that disclosed by Ho et al. (*Figures*) and can be used to control the coupling strength between the first and second free magnetic layers (*Paragraphs 0160 – 0162*).

It would therefore have been obvious to one of ordinary skill in the art at the time of the applicant(s) invention to modify the device of Ho et al. to use the functionally equivalent structure meeting applicants' claimed limitations as taught by Hayashi et al. since such a structure is a known functional equivalent and the insertion of the non-

magnetic layer can be used to control the coupling strength between the first and second free magnetic layers.

15. Claims 6 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ho et al. as applied above, and further in view of Singleton et al. ('753).

Ho et al. is relied upon as described above.

Ho et al. fail to disclose a specular layer meeting applicants' claimed material and structural limitations.

However, Singleton et al. teach using specular layers on an upper surface of the second free magnetic layer for improved MR ratio and sensitivity (*Figures; col. 2, lines 7 – 22; and col. 5, lines 32 – 49*).

It would therefore have been obvious to one of ordinary skill in the art at the time of the applicant(s) invention to modify the device of Ho et al. to use a specular layer meeting applicants' claimed limitations as taught by Singleton et al. in order to achieve improved MR ratio and sensitivity.

16. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ho et al. in view of Hayashi et al. as applied above, and further in view of Singleton et al. ('753).

Ho et al. and Hayashi et al. are relied upon as described above.

Neither of the above disclose a specular layer meeting applicants' claimed material and structural limitations.

However, Singleton et al. teach using specular layers either on an upper surface of the second free magnetic layer, or as the middle layer of a synthetic ferromagnetic structure (as taught by Hayashi et al.) for improved MR ratio and sensitivity (*Figures; col. 2, lines 7 – 22; and col. 5, lines 32 – 49*).

It would therefore have been obvious to one of ordinary skill in the art at the time of the applicant(s) invention to modify the device of Ho et al. to use a specular layer meeting applicants' claimed limitations as taught by Singleton et al. in order to achieve improved MR ratio and sensitivity.

#### ***Response to Arguments***

**17. The prior rejection of claims 1, 4, 9 – 12, 14 – 17, 19 and 20 under 35 U.S.C § 102(a),(b) and/or (e) and/or 103(a) – Various references**

The above noted rejection has been withdrawn because applicant(s) amendment(s) have set forth new limitations (e.g. “a second free magnetic layer disposed from an upper surface of the second antiferromagnetic layer to an upper surface of the first free magnetic layer, the second free magnetic layer distinct from the first free magnetic layer”) no longer anticipated, nor rendered obvious, by the above noted rejection.

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***Conclusion***

18. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Applicants' amendment resulted in embodiments not previously considered (i.e. "a second free magnetic layer disposed from an upper surface of the second antiferromagnetic layer to an upper surface of the first free magnetic layer, the second free magnetic layer distinct from the first free magnetic layer") which necessitated the new grounds of rejection, and hence the finality of this action.

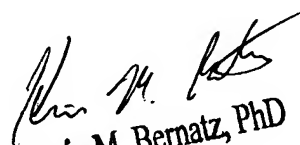
19. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin M Bernatz whose telephone number is (571) 272-1505. The examiner can normally be reached on M-F, 9:00 AM - 6:00 PM.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carol Chaney can be reached on (571) 272-1284. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

KMB  
June 24, 2005

  
Kevin M. Bernatz, PhD  
Primary Examiner